Swami Ramanand Teerth Marathwada University, Nanded

-: Name of the Research"

Synthesis and Characterization of Mn and Al doped CuO thin film by Spray deposition Method

Faculty of Science in the subject Physics

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1.INTRODUCTION:

For preparation and deposition of the films on different substrates by chemical the deposition material properties enhance the importance and utility of thin films in economic way. Techniques have been studies commonly those techniques facilitate designing of materials on molecular level. Various deposition techniques have been used for thin film formation, like chemical vapour deposition (CVD), molecular beam epitary (MBE), radio frequency magnetron sputtering; successive ionic layer adsorption and reaction (SILAR); Spray pyrolysis etc.

The study of morphological, structural, optical, and electrical properties of metal oxide thin film is important for designing of supercapacitors storage devices, highly efficient solar films, and nanotubes. Technologies important material films can be prepared by spray pyrolysis technique. Basically, it is a non-vacuum method, using a simple equipment one can deposited thin film by spraying a solution on heated surface so that the constituents react forming a chemical compound get evaporated from substrate. The substrate may be conducting or non-conducting like glass quartz, diamond, etc.

The Spray pyrolysis as an aerosol process that atomizes a solution and heats the droplets which are formed by the atomizer to produce solid particles. So, you can consider two steps or you can break down the spray pyrolysis method. Moreover, **CuO** has been also wide range of applications includeing health care, cosmetics, chemical industries, optoelectronics, catalysis, single electron transistor, light emitters non linera optical devices and photo-electrochemical applications. Doping has a significant impact on the structural, optical, and electrical structure of materials and hence it enhances of properties of the materials.

2. LITERATUR SURVEY:

- K. Saritha et al. observed that the CuO films exihibit high transmittnce in the visible spectrum. The increasing substrate temperature causes the decrease temperature causes the decrease in band gap energy from 2.10 ev to 1.9 ev.

- Diachenkoo et al. Studies on XRD analysis, it was determined that the CuO thin films are single-phase AFM and SEM measurements showed that the obtained films have a reasonably high surface roughness. An increase in the substrate temperature leads to an increase in grain size in the obtained thin film. .

- G. Papdimitropoulos et al. studied thin films of copper oxide grown by oxidizing vacuum evaporated copper thin film at temperature upto 225degreeC the obtained films were mainly composed Cu2O while at above this temperature CuO prevails.

  Muthukrishnan S. et al. Observed that the copper oxide thin film has been reported to exihibit p-type conduction and shows a band gap 2.44ev is a monoclinic crystal structure with lattice parameters a=5.4837degree and b=89.45 degree.

-Brouzid Boudjema et al. Investigated the physio-chemical

Properties of these films were investigated as a function of

the spray time. The obtained results indicated that the CuO

films were polycrystalline with a preferncial orientation

along the (111) plane.

- M.G. et al. [1] studied the chemical composition, XRD analysis

evidenced the Mn3O4 polycrystalline phase in a tetragonal structure with an intense diffraction plane (111), the preferred growth orientation along this direction. SEM images showed for Mn3O4 films with is improved with the Mg doping increase.

- kun, et al. [2] studied Mn oxide doped cu ocided (MODCO) was synthesized and used for removal of TTC, OTC, and CTC.

3. Abstract of proposed work plan:

In the present work on the synthesis of Mg and Al doped copper oxide based thin films will be grown onto conducting and nonconducting glass substrates by simple chemical spray deposition method.

Thin films are characterization like optical, electrical and morphological will be studied using XRD, SEM, EDAX, UV, Characterization techniques.

4.OBJECTIVE OF RESEARCH:

It is planed to deposit a Copper oxide (CuO) thin film on non conducting and conducting substrate by Spray Pyrolysis Method.

The different characterizations such as electrical resistivity, TEP, SEM, TEM, EPAX, UV, etc. studied for prepared thin film.

5.RESEARCH METHODOLOGY :

The Chemical spray pyrolysis will be used to deposit metal oxide thin films. The work will be carried out in the following manner:.

A) Spray deposited Thin Films.

Here we use pray pyrolysis technique to deposit uniform thin film of metal oxide on conducting and non-conducting substrate like glass at different concentration and temperature.

B) Stuctural Studies(XRD)

X-Ray differaction (XRD) technique gives idea about crystal structure interplanar spacing, lattice planes, lattice parameters, micro strain, dislocation density, number of crystallitesper unitarea and crystallite size will be obtained with the film properties.

C) Morphological studies

The morphologicl study of metal oxide thin films will b studies by using scanning Electron Microscopy (SEM) or Atomic Force Microscopy (AFM). The grain size, surface roughness, and porosity will be studies using SEM or AFM technique.

D) Compositional Studies

The compositional analysis of as deposited metal oxide thin films will be studied by using Energy Dispersive Analysis by X-Rays(EDAX) technique. The correlation between as taken composition will be obtained.

E) Optical Studies:

The optical absorption specra of Metal Oxide thin films will be obtained by using a UV-VIS-NIR (Ultraviolet-Visible-Near Infrared) spectrophotometer. The coefficien

of absortion, band gap energy (Eg), nature of transition, powder factor will be determined from optical absorption spectra.

The Mn and Al doped CuO thin films are to be deposited

By using Spray deposition Method.

6. IMPORTANCE OF STUDY/SOCIETY APPLICATIONS:

1. The work is planned only by considering its attempt not done at International level
2. It is applicative in optical coatings and light emitting materials.
3. The outcomes of the study will be for welfare of society at national and international levels.

7. CHAPTER SCHEME:

1) Chapter 1- Introduction:

Introduction about copper oxide based thin film

and its applications in various fields.

2) Chapter 2- Material and Methods:

Brief literature survey has been done and present

materials are selected.

3) Chapter 3- Experimental Technique:

Chemical deposition method is selected for different

Concentrations and temperatures. Spray pyrolysis

Depositions technique is used for present work.

4) Chapter 4 - Result and anlaysis by using XRD, UV, IR, etc.

5) Chapter 5- Conclusion and future work plan.

8. YEARWISE PLAN OF WORK:

- **First year:**

  During the first year of research work will be completed. All chemicals will be procured. A thorogh literature survey will be done in order to get a good knowledged of copper oxide and supercapacitors. Two progress reports will be submitted to university during the year.

- **Second year:**

  During second year, good quality and uniform thickness thin film are to be prepared. Thin film will be characterized by various techniques such as XRD, SEM, FESEM, AFM, and EDAX in order to study the structural, morphological and compositional properties. The films will be discussd and interpreted. At least two progress reports will be sent during the year. Two research papers will be communicated to the reputed journals at the end of the year.

- **Third year:**

  Results obtained in the second year will be analyzed and published in Reputed journals. In addition the outcomes of our research work will be presented in national and international gathering such as Seminars, Worshops, and conferences set during this year. Once this is done, final synopsis will be submitted and after this thsis will be written. The thesis will be submitted to the university.

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